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FOREST INSECT INVESTIGATIONS

PRELIMINARY REPORT ON THE SURVEY OF THE BIG HOLE BASIN INSECT CONTROL PROJECT SHOWING THE CONDITIONS FOLLOWING THE 1928 REINFESTATION

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September 15, 1928

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FOREST INSECT
LABORATORY

PRELIMINARY REPORT
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BIG HOLE BASIN INSECT CONTROL PROJECT
SHOWING THE CONDITIONS FOLLOWING THE 1928
REINFESTATION

Wisdom, Montana.
Sept. 15th, 1928.

/s/ James C. Evenden
Entomologist.

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REINFESTATION.

INTRODUCTION

This report has been prepared for the purpose of giving at an early date the conditions within the Big Hole Basin as shown by the insect survey which is being conducted at this time. This survey will not be completed until after the 1st of October, but it is believed that sufficient data has been secured from which to formulate a fairly accurate estimate of the amount of 1928 infestation in each of the units. When the survey is completed it will no doubt be necessary to change the estimate for all of the units, though it is believed that such changes will not be of material amounts.

In considering the advisability of continuing this project for another season, which will call for the expenditure of a large sum of public funds, there are two important factors which must receive the proper consideration. The first of these is the source of the re-infestation which is occurring annually within the Big Hole Basin. As is generally known the plan under which this project has been operated is called a Barrier Plan of Control. This plan called for the establishment of the Big Hole Basin as a zone of defense in which all infested trees were to be treated each year as long as re-infestation occurred. No es-

timate could be made as to the number of years it would be necessary to carry on this work as it was governed entirely by the extent of the beetle supply which was present on the East Fork of the Bitterroot River. The second important factor which must be considered is the infestation of the mountain pine beetle in the lodgepole pine stands of the Salmon National Forest. The seriousness of this epidemic, and that there were heavy blocks of infested trees on the Wimpey Creek drainage which is just over the Continental Divide from the head of the Big Hole Basin, became known during the 1927 season. This condition was mentioned in last years reports but at that time it was not known that the beetles had started to cross into the Beaverhead National Forest so apparently was not considered as being serious. These two factors must now enter seriously into the analysis of the problem.

In summarizing the conditions within the project area as shown by the 1928 survey an attempt has been made to present the situation in the same light with which the writer views the problem in order that the readers of this report may secure a full understanding as to its seriousness. It is realized that some of the statements as given could give an impression that the results of the survey have been surprisingly discouraging. Though of course it was hoped that there would be a marked reduction in this years infestation throughout the project area the data secured was not a surprise as a heavy flight of beetles

from the Bitterroot was expected and feared. The present situation has been foreseen and its occurrence, with the exception of the infestation to the south of the Big Hole Basin, has been predicted in all previous reports. The data secured from the regions south of the Big Hole Basin was indeed a discouraging surprise, and as stated in the body of this report can only be accounted for through a flight of beetles from the Salmon infestation.

Reference is made to the map accompanying this report on which the various units have been designated. A discussion of these units follows.

PINTLAR UNIT

There are some 21,760 acres in this unit which should be covered by control work. This acreage does not extend the western limits of the unit to the Continental Divide as that portion is so rough that it would be nearly impossible to carry on control work. The data secured from the survey shows that there are .84 - 1928, and .25 - 1927(#) infested trees per acre. This gives a total of 18,278 new attacks and 5.440 trees attacked in 1927. To assume that the 1928 infestation came from the 1927 attacked trees left by the control work would mean an increase of 230 percent. Though such an increase is possible it is believed that a portion of the new attacks came from a flight of beetles from other regions.

(#) The expression 1927 attack and red top are synonymous.

MUSSIGBROD UNIT

There are some 20,000 acres in this unit which should be covered by control work if a thorough cleanup was made. This acreage does not reach to the Continental Divide, as it would be very difficult to work the higher elevations, and it is necessary to stop some place for the infestation extends for many miles over the Divide. The survey data shows that there are

some 39,000 - 1928, and 8,000 - 1927 attacked trees in the unit. To assume that the 1928 infestation came from the 1927 attacked trees left in the unit following the control operation would mean an increase of 390 percent. I do not believe such an increase occurred and can only account for the 1928 infestation through an influx of beetles from the Bitterroot.

BATTLEFIELD UNIT

The 37,000 acres assigned to this unit does not include the upper portion of the Trail Creek drainage. In this region a rather heavy infestation, which becomes more severe closer to the Continental Divide, appeared this season for the first time. Large groups of newly infested trees are to be found which are several miles from the nearest 1927 attacks. Close to the Divide the infestation is very heavy, averaging nearly eight trees to the acre.

In the lower portion of this unit the survey data shows that there are .57 newly attacked trees which gives a total of 21,180 for the unit. The 1927 attacked trees left by the control operation only averaged .07 trees per acre or 2,600 for the unit. This means an increase of 710 percent which is hardly possible so the re-infestation of the unit can only be explained by a flight of beetles into the area.

WEST SIDE UNIT

On this unit there are some 33,000 acres, and perhaps many more, which should be covered by control measures if a thorough cleanup of the area was to be made. The survey data which is available for this unit is rather meager in character, but as it was secured from the areas which were covered by control one can be assured that this data applied to the entire area will give a conservative estimate. The data available shows an average of .43 newly attacked trees per acre, or a total of 14,190 for the unit, as against a total of 1,980 red tops. With the completion of the survey the percentage of red tops will be increased as there were large areas of 1927 infestation which were not covered by control.

JACKSON UNIT

In this unit there are approximately 28,160 acres which would need be covered by control if all of the infested trees which occur from the southern spread of the Bitterroot infestation are treated. However should the infestation on the Wimpey Creek drainage of the Salmon National Forest spread into this unit, then the acreage would need be increased as the work was pushed back towards the Continental Divide. The actual conditions within this area are not known at this time for the 1928

survey has not extended into this unit. However based upon the conditions within the other areas an estimate of .30 per tree per acre is made which would give a total of 8,400 newly attacked trees for the unit. Such a figure is very conservative and there is little doubt but that when the survey has been completed the amount of 1928 infestation will be found to be nearly twice as much as the estimate given.

BLOODY DICK UNIT

This unit has never been considered in previous plans of this project, and furthermore it is sincerely believed that the infestation within it came from regions other than the Bitterroot or Big Hole Basin. At the head of the Bloody Dick drainage there is a continuous body of lodgepole pine extending through a rather low pass into the Wimpey and Pratt creek drainages of the Salmon Forest, where in 1927 heavy blocks of infested trees were present. It is therefore believed that the infestation in this unit, and perhaps that of the Jackson unit, came from the Salmon Forest rather than the Bitterroot. The first noticeable loss within this unit occurred with the 1927 attack, though there may have been a few scattered trees prior to that time.

In the Bloody Dick Unit there are some 48,640 acres with an average 1928 infestation amounting to .38 of a tree per acre. This average gives total of 18,483 newly attacked trees for the unit. There were but 5,836 red tops in the unit which shows an increase from the 1927 to the 1928 infestation of 216 percent. This unit must be considered in all future plans of control.

RATTLESNAKE UNIT

The conditions within this unit would seem to more than justify its inclusion into the plans for future control. The data secured from the survey shows an average of .05 trees per acre with no red tops whatever. This is not a very heavy infestation but the data secured would seem to indicate that this is the first year which the beetles have been in the area and that in a year or more a serious situation will exist. There are some 48,000 acres in this unit which give a total of 2,592 newly infested trees. It is also possible that the infestation within this unit could have come from the Salmon Forest, as it is much closer than any other heavy block of infestation from which one could expect a flight to occur.

GRASSHOPPER UNIT

This unit was not considered in the previous plans of this project, and even at this time the data secured does not indicate a condition much above that of a normal condition. The

newly attacked trees which were found existed as scattered individuals or in very small groups. However it is well to recognize the fact that there are insects with the area so that the proper consideration will be given to it in all future plans. There are 41,600 acres in the Grasshopper unit and the data secured shows that there are an equal number of new attacks and red tops which is further indication of a normal condition. The average was .013 trees per acre which gives a total of 540 new attacks with an equal number of red tops.

WARM SPRINGS UNIT

Though this unit was considered in the 1928 plan of control no work was conducted within it as the infestation was not above that of a normal infestation. Survey data taken from the southern portion of this unit indicates that there has been a heavy increase from the 1927 to the 1928 attacks. In this portion of the drainage the new attacks averaged .43 per acre as against .01 red top. As data is not as yet available for the upper portion of this unit it again becomes necessary to make an estimate of the amount of new infestation. This estimate is set at 8,000 trees for the entire unit, and there is little doubt but when the survey is completed this total will be materially increased.

The marked increase which occurred in the southern portion of the unit could have been caused by a flight of beetles from the Salmon Forest, which lies but 24 miles to the southwest, or it could have come from the 1927 infestation on the head of Fox Gulch, in the southern portion of the East Side unit which was left untreated last season.

HORSE PRAIRIE UNIT

The present condition of this unit will necessitate it being considered in all future plans of control dealing with this project. There are some 24,000 acres in this unit and approximately 2 1/2 percent of the unit was intensively covered by the survey. The data secured shows that there is an average of .48 new attacks and .24 red tops per acre. These figures give a total of 11,673 new attacks and 5,836 red tops, which indicates an increase of 100 percent. It is rather difficult to account for this rather surprising condition unless the insects came from the Salmon infestation a few miles distant on the west side of the Divide.

EAST SIDE UNIT

There are approximately 49,280 acres in this unit, and though the survey has not been completed sufficient data has been secured to give a fair idea of the 1928 infestation. The data secured shows an average of .73 new attacks and .18 red tops per acre.

This gives a total of 35,974 new attacks and 8,870 - 1927 attacks which were not treated by the 1928 control operation. The increase from the remaining 1927 to the 1928 attacked trees amounts to 300 percent. It is sincerely believed that this increase was augmented by a flight of beetles from other more heavily infested areas.

LOWER WISE RIVER UNIT

No survey data has been secured from this unit so it is necessary to make a very rough estimate of the 1928 infestation which has been set at 18,432 trees. This is but an estimate only with no data from the area whatever.

UPPER WISE RIVER UNIT

From the data secured from the upper portion of this unit it is found that the insects have undoubtedly crossed the mountains along the east side of the Basin and are now fairly well established in the unit. From the data secured the new attacks show an average of .077 trees per acre while the red tops only averaged .017. These figures give a total of 11,088 new attacks and only 2,448 red tops. These totals show an increase of 306 percent which would indicate a condition above that of a normal infestation.

SUMMARY TABLE OF UNITS

UNIT	ACRES	1928 TREES	1927 TREES	INCREASE	BASIS FOR ESTIMATE
Pintlar	21,760	18,278	5,440	230 %	Strip survey-complete
Mussigbrod	20,000	39,800	8,000	390 %	Strip survey-complete
Battlefield	37,120	21,158	2,598	710 %	Strip survey-incomplete
West Side	33,000	14,190	1,980	610 %	Strip survey-incomplete
Jackson	28,160	8,400	No data	---	Estimate only - No data.
Bloody Dick	48,640	18,483	5,836	216 %	Strip survey-complete
Horse Prairie	24,320	11,673	5,836	100 %	Strip survey-complete
Rattlesnake	48,000	2,592	None	---	Strip survey-complete
Grasshopper	41,600	540	540	0 %	Strip survey-complete
Warm Springs	51,200	22,016	512	4200 %	Strip survey-complete
East Side	49,280	35,974	8,870	300 %	Strip survey-incomplete
Lower Wise Ri.	61,440	18,432	No date	---	Estimate only-no data.
Upper Wise Ri.	144,000	11,088	2,448	306 %	Strip survey-complete

BITTERROOT EPIDEMIC.

The extent and probable life of the Bitterroot epidemic enters into all future thoughts of insect control within the Big Hole Basin. It is true that the infestation on the East Fork of the Bitterroot River has split and is now spreading to the north as well as the south, but that portion which is going to the south is still of an enormous magnitude. To the north the epidemic has swept through the Bertie Lord, Moose, and Martin Creek drainages, into the Rock Creek drainage of the Missoula National Forest where a

very heavy 1927 attack occurred. To the south it has spread steadily along the west side of the Continental Divide with rather heavy flights of beetles into the Big Hole Basin. Mink and Springer Creeks and the heads of the Tolan and Meadow Creek drainages were heavily hit by the 1928 attack. Even in the areas where the infestation has been present for several years there are still thousands of trees being attacked each year. These are the smaller trees which are taken by the beetles in the mopping up which occurs in the rear of such epidemics.

Along the Continental Divide on the heads of the Tolan and Meadow Creek drainages there are large areas of mature pine which as yet has not been attacked by the beetles. These areas are of sufficient size to maintain a severe epidemic for several years. This is practically the first year that the insects have been in these heavy timber stands, and there are thousands of 1928 attacks with no red tops whatever. A survey of some 19,000 acres along the heads of the Tolan and Meadow Creek drainages shows the 1928 infestation to average 15.8 trees per acre, with a total of 303,000 for the area. New year the infestation in these areas will be a great deal heavier with larger flights of insects into the Big Hole Basin. This information will eliminate the thought that perhaps the source of re-infestation for the Big Hole Basin was nearly exhausted.

DISCUSSION OF PRESENT CONDITIONS

The survey of 1927 showed that there were approximately 65,000 1927 attacked trees within the Big Hole Basin. The available data from this season's survey, which is under-way at this time, shows that there are some 222,624 newly infested trees within the Beaverhead National Forest, which are south, and ahead of the Bitterroot infestation. Furthermore these data show that within the Big Hole Basin there are 189,000 - 1928 attacked trees as against 65,000 for the 1927 season. These figures show an increase of nearly 200 percent throughout the region where control measures were conducted during the past season. When the present insect survey is completed it will no doubt be necessary to change the above figures, though it is douted if such a change will be a material one.

With this number of infested trees to treat during the 1929 season, and the Warm Springs, Rattlesnake, Grasshopper, Bloody Dick and Horse Prairie units to be added to the present zone of defense, at least $325,000 will be required to continue the project under the present plan. These facts make the thoughts of continuing the present plan rather prohibitive due to the necessary expense and the physical difficulties of conducting such a large scale operation. Furthermore one is obliged to look beyond the 1929 season, for the continuation of the present plan will call for the expenditure of large sums of money over an indefinite number of years, with no guarantee of success.

In future control plans for this project the Salmon infestation cannot be disregarded, for it seems reasonable to assume that the infestation within the areas to the south of the Big Hole Basin, and possibly in the southern end of the Basin, came from this epidemic. Furthermore the infestation which is in the southern areas must be considered in all plans. The primary objective of this project is to prevent the southern spread of the Bitterroot epidemic through these areas to the south, so to disregard the infestation which is already present would be anextremely untenable position.

In planning for the 1929 season we have as an alternative to the expenditure of the necessary $325,000, the possibility of once more giving ground and establishing a new zone of defense. The only feasible location for such a zone would be that portion of the Beaverhead National Forest which lies to the south of the Big Hole Basin. This zone is shown on the map accompanying this report. This area would seem to offer a far simpler problem than the present zone which covers the entire Big Hole Basin, as the timber stands are more scattered and the acreage involved is much smaller. However in the adoption of this zone there would be no effort directed towards preventing the infestation from developing within the Wise River Unit and spreading east into the Madison National Forest. It is true that there is a wide barren

country between that portion of the Beaverhead and the Madison Forests, but it is also true that there is a barrier nearly as wide between the lodgepole pine stands of the proposed zone and that portion of the Madison which lies to the east. So it would seem that the danger of a southern spread is nearly equal for both these areas. In the proposed new zone of defense there are approximately 33,288 trees which have been attacked during the present season on an area of some 162,000 acres which would need be covered by control. It is possible that this zone could be held, yet no assurance can be given that as the heavy blocks of infestation approach, which will happen if the epidemic continues, that the available host material will not be destroyed and the insects spread to the nearest timber stands. In the adoption of any zone of defense or any plan of control, it must be realized that the epidemic which is being combatted is spreading, and that its advance is made by long flights of insects and not the slow building up of heavy centers of infestation. The maximum distance of these flights is not known, yet it is safe to assume that under favorable conditions a barrier of fifteen miles would not be effective against their spread. By this statement it is not meant that the insects will always cross a fifteen mile barrier, but with favorable brood and climatical conditions the writer feels that such a flight is easily possible.

This rather brief discussion of the present conditions has

been offered in the hopes of assisting the reader to better visualize the many factors which enter into the consideration of the problem.

RECOMMENDATIONS

In offering recommendations for the future consideration of this project the writer feels that his task does not lie in the determination of the economics of the problem, but is showing the entomological possibilities gained from our present knowledge of the situation. In such consideration it would seem that the primary objective of this project must be the prevention of the southern spread of the epidemic into the areas to the south of the Beaverhead, for it would now seem that regardless of what action is taken all of the timber within the Basin will be killed by the insects. In this connection there are three possible courses which can be followed in considering the future of the project which are as follows:

First	Continuation of the present plan of control with the addition of the Warm Springs, Rattlesnake, Grasshopper, Bloody Dick, and Horse Prairie units to the present zone of defense.
Second	Abandonment of the present zone of defense and the adoption of the new one as shown on the attached map. It is possible that this zone should be enlarged so as to include the entire eastern portion of the Beaverhead Forest.
Third	Abandonment of the project within the Beaverhead National Forest with careful observation and prompt action to check any outbreaks occurring within the forests to the south and east.

A brief discussion of these three proposals, with the most apparent

advantages and disadvantages follows:

FIRST PROPOSAL

The only advantage of this plan is that any benefits of the work already performed would be secured, and that the possible sptead from the northern portion of the forest to the east might be prevented. Furthermore it may be that there is sufficient timber within the Basin to catch all of the infestation and in that way prevent the spread of the main bodies of the infestation due to the lack of available host material.

There seems to be little advantage to the thoughts of attempting to hold the Big Hole Basin as the expense of such an operation seems to be economically prohibitive, and is untenable unless the areas to the south are included. Furthermore, no assurance can be given as to the success of the project. The heavy blocks of infestation on the Salmon and Bitterroot Forests are now nearly to the crest of the Continental Divide so even heavier flights of beetles can be expected in the future, which would seem to insure the destruction of the timber within the Big Hole. If the question of funds could be disregarded it is doubted if it would be physically possible to hold the present area. The total acreage is tremendous and with the development of heavy centers such as found on the Salmon and Bitterroot, where it is not uncommon to find as many as 50,000 to 65,000 trees per section, the total man power required would be nearly impossible to secure.

SECOND PROPOSAL

The advantage of this plan as seen by the writer is that the acreage involved is a great deal smaller and that the timber stands are more or less scattered. Furthermore, if it is an advantage, the zone could be compared to a funnel with both the Salmon and Bitterroot epidemics pouring in at the top. Though this would no doubt result in a concentration of the insects at this point, it might prove to be so heavy that the timber stands would soon be destroyed and the beetles forced to seek other areas for host material.

Unfortunately the disadvantages of this plan at least counterbalance the advantages for in addition to the above possibility the plan offers no protection against an eastern spread of the insects from the northern portion of the Beaverhead, which has the same potential danger as the area protected by control.

THIRD PROPOSAL

Such a move would take advantage of the potential protection offered by the rather wide barriers of open country which lie to the south and east of the Beaverhead Forest over which we are not sure the insects will cross. There is also the possibility of saving rather large sums of money should it prove that the insects will not cross this barrier. Furthermore should there be a flight of insects over this open barrier it is possible that it will be a very light one and that the main force of the epidemic will not be

felt within the areas to the east.

The disadvantage of such a plan lies in the cessation of our present efforts to check the southern spread of the epidemic.

CONCLUSIONS

In conclusion it would seem that in summing up the advantages of the three proposals of control offered that the infestation which is now present in the southern portion of the Targhee National Forest should be taken into consideration, as this region is one which the present project is trying to protect. Of the three proposals it would appear that the second and third are the only ones worthy of consideration.

Should the second proposal be adopted an appropriation of at least $50,000 would be required to adequately cover all of the area, as in any plan of control it must be understood that all of the scattered groups of infested trees must be treated regardless of the cost per tree. Though there is but little entomological advantage to be seen at this time between proposals two and three, it is recommended that proposal two be adopted provided there are sufficient additional funds to adequately care for the infestation which is now present in the southern portion of the Targhee National Forest. However, if there are not sufficient funds available for both projects it is recommended that Propos-

al three be adopted and our entire efforts directed towards the infestation which is already within the regions we are trying to protect.

Respectfully submitted,

/s/ James C. Evenden

James C. Evenden
Entomologist

COPY

Bitterroot N. Forest Infestation

Missoula N. Forest Infestation

Pintlar Unit
21,760 Acres
(18,278) Trees

Control
1927-28

303,000 Trees
1928 Attack

Mussigbrod Unit
20,000 Acres
(39,800) Trees

Control
1926-27-28

Control
1928

Lower Wise River Unit
61,440 Acres
(18,432) Trees

Control
1926-27-28

Battlefield Unit
37,120 Acres
(21,158 Trees

East Side Unit
49,280 Acres
(35,974) Trees

Upper Wise River Unit
14,400 Acres
(11,088) Trees

Control
1928

Source of Supply

West Side Unit
33,000 Acres
(14,190) Trees

Control
1928

Warm Springs Unit
51,200 Acres
(22,016) Trees

Grasshopper Unit
41,600 Acres
(540) Trees

Rattlesnake Unit
48,000 Acres
(2,592) Trees

Jackson Unit
28,160 Acres
(8,400) Trees

Bloody Dick Unit
43,640 Acres
(18,483) Trees

Proposed Zone of Defense

Potential Spread of Infestation

Salmon N. Forest Infestation

Horse Prairie Unit
24,320 Acres
(11,673) Trees

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
W. B. GREELEY, FORESTER

BEAVERHEAD NATIONAL FOREST
MONTANA
MONTANA PRINCIPAL MERIDIAN
1926

H. H. Rust
Sept 1/28

LEGEND
- National Forest Boundary
- Adjacent National Forest Boundary
- Good motor road
- Poor motor road
- Trail
- Railroad
- Supervisor's headquarters
- Ranger station
- Administrative site
- Triangulation station
- House, cabin, or other building